

# Informal Examiner's Amendment

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## TITLE OF THE INVENTION

### MODULATOR AND DEMODULATOR

now U.S. Patent

This application is a Divisional of Serial No. 10/036,428, filed January 7, 2002.

### BACKGROUND OF THE INVENTION

No. 6,747,524

#### Field of the Invention:

This invention relates to a modulator for modulating a carrier wave with an in-phase component (I component) signal and a quadrature component (Q component) and a demodulator for demodulating the in-phase component signal and quadrature component signal, particularly to a technology enabling broadband modulation and demodulation with simple control.

#### Description of the Prior Art:

In, for example, intelligent transport systems (ITS) used to increase traffic efficiency through exchange of information among people, vehicles and roads, consideration is being given to use of software radio that uses software to send and receive wireless signals.

Wireless devices such as software radios need to be equipped with modulator and demodulator units for high-frequency and/or broadband wireless communication.

An example configuration of a modulator-demodulator unit conventionally used for analog modulation-demodulation will be explained.

FIG. 5 shows the configuration of an analog quadrature modulator provided downstream of a digital unit D21. Although the digital unit D21 is included in the drawing for convenience of explanation, it should be noted that the digital unit D21 would not ordinarily be a component of an analog quadrature modulator.

In the analog quadrature modulator shown in the figure, an in-phase component signal output by the digital unit D21 is input to an in-phase component side mixer (MIX) MI21 and a quadrature component signal output by the digital unit D21 is input to a quadrature component side mixer (MIX) MQ21.

Further, in this analog quadrature modulator, a local signal generator (OSC) OSC11 generates a signal having the frequency of, for instance, a carrier wave signal ordinarily used in communication (carrier wave frequency) and the signal having this carrier wave frequency is output as an in-phase component carrier wave signal to the in-phase component side mixer MI21 without modification and the signal having the carrier wave frequency is also output to a 90-degree (°) phase shifter P11. The 90-degree phase shifter P11 shifts the signal received from the local signal generator OSC11 90 degrees and outputs the phase-shifted signal to the quadrature component side mixer MQ21 as a quadrature component carrier wave signal.

The in-phase component side mixer MI21 mixes the in-phase component carrier wave signal received from the local signal generator OSC11 and the in-phase component signal received from the digital unit D21 to modulate the in-phase component carrier wave